

A black outline map of the state of Oklahoma is centered on the page. The text 'GUIDELINES FOR PREPARING UTILITY PLANS' is written in a bold, sans-serif font and is centered within the map's outline.

# **GUIDELINES FOR PREPARING UTILITY PLANS**

18-Feb-2004

## INTRODUCTION

### Utility Section Overview

The Utilities Section, which is part of the Right-of-Way Bureau, acts as liaison between the Montana Department of Transportation (MDT) and utility companies when these Companies wish to locate facilities within MDT right-of-way and when utilities require relocation or modification because of conflicts with MDT projects.

With respect to relocation activities, the Utilities Section provides guidance on issues and works directly with utility companies to determine relocation alignments and create agreements for cost sharing. The Utilities Section processes relocation agreements for approval. It also handles bills from utility companies for cost reimbursement. The Section serves in a similar capacity when county/city water and sanitary sewer facilities must be relocated for a construction project.

The Utilities Section develops and implements procedures governing the occupancy of highway facilities by public utilities. It is responsible for ensuring compliance with Federal codes, Montana statutes and Department policies relating to utilities. This includes provisions governing eligibility for cost reimbursement for utility relocations.

The Utilities Section administers the Department's Subsurface Utility Engineering (SUE) Program. The program uses engineering consultant contractors to locate, survey and obtain depths of utilities for selected MDT reconstruction projects.

## UTILITY PLANS PREPARATION

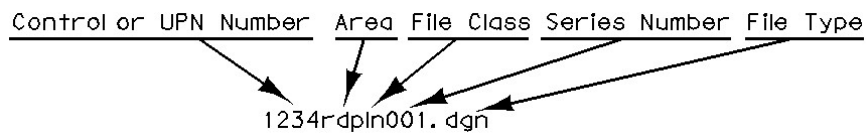
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References: MDT Right-of-Way Manual  
MDT Road Design Manual  
MDT CADD Standards

## I. Title Sheet

The title sheet should show the project location on the state map and in more detail on the county map. It should include the project beginning and ending stations; bridge stations if any and clearly identifies the route number and county. A plan legend will also be included showing standard symbols and symbology shown on the utility plans. Related and associated projects along with the FHWA/MDT approval and R/W map revised block are also included. Design data, federal R/W project number, project name, county and project length are shown on the utility title sheet.

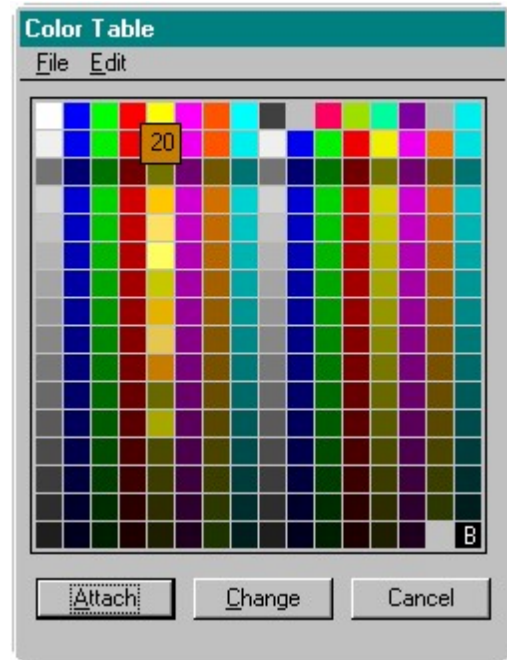
All reference to design files assumes proper DMS naming conventions have been followed. In this and all other procedures 1234 represents the 4-digit project control number.



### Procedure for creating the utility title sheet:

1. Download the title sheet from the rd workgroup in DMS usually named 1234rdttl001. Copy this file to the c:\dgn\ref directory for referencing. Rename the original downloaded file in c:\dgn to 1234utttl001. Download the R/W title sheet from DMS usually named 1234rottl001 and move to the directory c:\dgn\ref for referencing.
2. Open the file 1234utttl001 and move title sheet to page 1 if not already there.
3. Delete all active elements with the exception of the arrow and text "this project" in the state map portion of the title sheet.
4. Open reference file dialog and turn off all levels except levels 1-4 in planm (sht) reference file.
5. Attach reference file utiplanmV80.ref to the file.
  - o Logical name – sht1
  - o Description – utility metric plan sheets
6. Turn off all levels in reference file utiplanmv80 (sht1) except:
  - o 16 – plan legend
  - o 17 – north arrow (if needed)
  - o 18 – R/W approval blocks
  - o 19 – utility plan designation
  - o 30 – 36 utility standard symbologies
  - o 49 – utility designation (left border)
  - o 54 – state map
  - o 55 – design data block
  - o 57 – MDT designation
7. Place cell *ttlsh*t from utilityV8\_0 cell library and fill in project information data fields. Note project agreement number is the same as the R/W agreement number.
8. Attach as reference the file from c:\dgn\ref containing the road title sheet 1234rdttl001 and move down to sheet 1 if not already there.
  - o Logical name – rd1

- Description – design data
- 9. Place fence around design data (upper right hand corner) and clip reference file (rd1) to show design data only.
- 10. Copy reference file (rd1) and rename to:
  - Logical name – rd2
  - Description – title map
- 11. Place fence around county map area and clip bound to show map and project map information. May need to move reference file (rd2) to display this information clearly.
- 12. Attach as a reference from c:\dgn\ref the R/W title sheet 1234rottl001. Move to correct location in the utility title sheet design file if necessary.
  - Logical name – rw1
  - Description – authorization
- 13. Place fence around FHWA\MDT approval, Associated and Related projects blocks and clip bound (rw1) to show this data only.
- 14. In active file turn on level symbology setting from view attributes dialog. Go to settings – level – symbology and override color in active design file to 0 then save settings.
- 15. Attach utilityV8\_0 color table to active design file.
- 16. Open reference file dialog box, set color symbology override to color 0 in all reference files with the exception of utiplanmv80.ref.
- 17. For the reference file utiplanmv80 override all color level symbologies to color 0 except for levels 30 – 36 that are overridden to:
  - 30 – 3 (Red)
  - 31 – 20 (Gold)
  - 32 – 0 (White)
  - 33 – 2 (Green)
  - 34 – 5 (Purple)
  - 35 – 6 (Orange)
  - 36 – 1 (Blue)
- 18. Copy shape from level 9 in utiplanmv80 (sht1) reference to active file making sure the shape remains on level 9 and line code 5. Copy only the shapes around the individual sheets to be plotted within the design file. This shape is needed for plotting using batch plot within microstation.



## II. Table Contents, Notes etc.. Sheet

The table of contents is unique to the utility plans and lists all sheets contained in the utility plans package. All sheets in the utility plans begin with a capital U in the page number sequencing. With the exception of the cross sections that are a direct copy from the road design plans and numbered accordingly. Other items that may be included on this sheet are notes, skew diagram, clear zone table and linear & level data.

The following procedure assumes the table of contents is to be included as page 2 in the title sheet file 1234utttl001, all reference to design files assumes proper DMS naming conventions have been followed.

### Procedure for creating the utility table of contents sheet:

1. Open design file 1234utttl001 and window area to view sheet 2.
2. Open the reference file dialog box, turn on the following level in the utiplanmv80 (sht1) reference file:
  - o 52 – utility project information block (right side of sheet)
3. Place cell *plnsht* from utilityV8\_0 cell library and fill in project information data along right hand side of sheet.
4. Place cell *tblcon* from utilityV8\_0 cell library, drop status and edit to show table of contents information from the utility plans package.
5. Attach as a reference the downloaded file from c:\dgn\ref containing the table of contents 1234rdttl001 and move if necessary so the table of contents and notes are visible in sheet 2.
  - o Logical – rd3
  - o Description – Notes
6. Place fence around notes and clip bound to show notes and any other information that can be clearly shown with the same clip bound. Move reference to center in right upper 1/3 of sheet.
7. Copy reference file (rd3) and rename to:
  - o Logical – rd4
  - o Description – Linear & Level
8. Place fence and clip bound around linear and level data then move to display clearly on sheet.
9. Repeat the above steps to attach other references as necessary.
10. Make any final adjustments to all reference files to display clearly on page then set reference file color symbology to 0 on all references to this page.
11. Copy shape from level 9 in utiplanmv80 (sht1) reference to active file making sure the shape remains on level 9 and line code 5. Copy only the shapes around the individual sheets to be plotted within the design file. This shape is needed for plotting using batch plot within microstation.

### III. Control Diagram and Abstract sheet

The control diagram is used to establish a permanent, recoverable horizontal and vertical control system for highway design and construction. All topography and design data including utilities, hydrology, right-of-way, bridge and miscellaneous data is tied to the control diagram. The control abstract gives the coordinates and elevation of each control point along with a brief description of how to find or reach the control point. The control diagram and abstract are made available to utility companies for use in engineering utility relocation work and is included in the utility plans package.

All reference to design files assumes proper DMS naming conventions have been followed. The following procedure assumes a new utility design file is to be made for the control diagram and abstract, and the control diagram and abstract will fit on one sheet. Modifications to this procedure, the procedure itself, or portions of the procedure may need to be repeated if more than one sheet is needed for the complete control diagram and abstract.

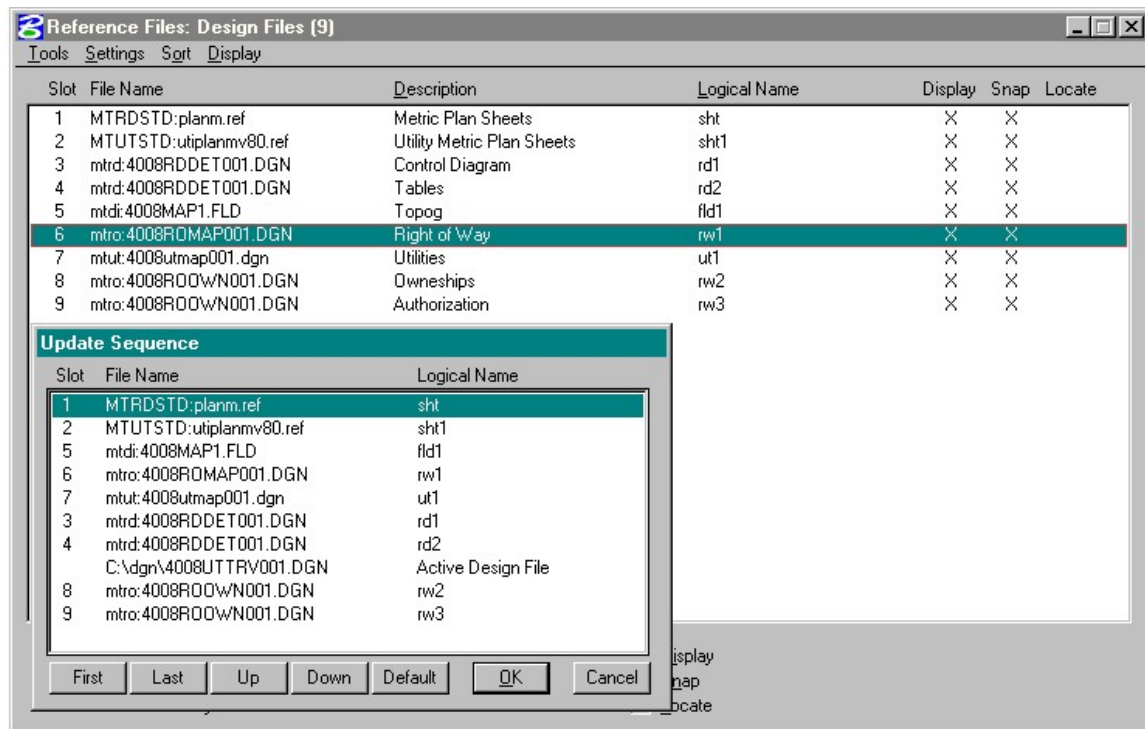
#### Procedure for creating the utility control diagram and abstract sheet:

1. Download the file from the rd workgroup in DMS that contains the control diagram and abstract usually named 1234rdtrv001. Copy this file to the c:\dgn\ref directory for referencing. Rename the original downloaded file in c:\dgn to 1234uttrv001, open the file and delete all active elements.
2. Attach the reference file utiplanmV80.ref to the file.
  - o Logical – sht1
  - o Description – utility metric plan sheets
3. Turn off all levels in reference file (sht1) except for:
  - o Level 49 – utility designation (left border)
  - o Level 51 - utility project information block (right side of sheet)
4. Turn off all levels except 1-4 in planm.ref (sht) reference file.
5. Attach utilityV8\_0 color table to active design file.
6. In active file turn on level symbology setting from view attributes dialog. Go to settings – level – symbology and override color in active design file to 0 then save settings
7. Place cell *plnsht* from utilityV8\_0 cell library and fill in project information data along right hand side of sheet.
8. Attach as reference the original file from c:\dgn\ref containing the control traverse 1234rdtrv001. Clip bound the reference to show only the traverse diagram, adjust as needed to fit sheet and display information clearly.
  - o Logical – rd1
  - o Description – control traverse
9. Copy and rename the reference file attachment (rd1) to:
  - o Logical – rd2
  - o Description – control abstract
10. Adjust the clip boundary to show only the control abstract and/or other information contained in the rd area control diagram sheet, move if necessary to display clearly on the sheet.

11. Download and attach the topography file as a reference – usually located in the di workgroup in DMS but may be from other workgroups depending on the project. This file will need to be scaled, rotated and moved to fit the sheet.
  - Logical – fld1
  - Description – topography
12. Turn off all levels except those containing general topog (fences, buildings, ptw, streams, breaklines etc..).
13. Open in reference file dialog, level symbology and override all levels color symbology to color 32 (gray).
14. Attach R/W map file as reference.
  - a) This can be accomplished by copying the (fld1) reference file and renaming the copy to the R/W map file 1234romap001. By copying and renaming the reference file the scale, rotation and location of the (fld1) file is applied to the R/W map file.
    - Logical – rw1
    - Description – right of way
15. Open reference file level dialog and turn off all levels except:
  - 16 – Exterior section lines
  - 35 – Interior section lines
16. Override all level 16 to color 0 (white) and level 35 to color 32 (gray).
17. Attach as a reference the file containing utilities. The utility information is usually contained in one or more of the following files: 1234utsue001, 1234utmap001, 1234rdmap001, 1234dimap001 or 1234phmap001.
  - a) This can be accomplished by copying the (fld1) reference file and renaming the copy to the utility map file (ie 1234utmap001). By copying and renaming the reference file the scale, rotation and location of the (fld1) file is applied to the utility map file.
    - Logical – ut1
    - Description – Utilities
18. Repeat the above steps if more than one file contains utility information (ie. logical – ut2...).
19. Open reference file dialog box, turn on utility levels and override reference file colors as follows:
  - 30 – power, 3 (Red)
  - 31 – gas, 20 (Gold)
  - 33 – san & storm, 2 (Green)
  - 34 – television, 5 (Purple)
  - 35 – telephone. 6 (Orange)
  - 36 – water, 1 (Blue)
20. Open reference file dialog box, go to settings – update sequence and change update sequence as follows:
  - 1) Plan Sheet Borders (sht)
  - 2) Utility Plan Sheet (sht1)
  - 3) Topography (fld1)
  - 4) Right of Way (rw1)
  - 5) Utilities (ut1)



- 6) Control Diagram (rd1)
- 7) Abstract, Tables (rd2)
- 8) Active Design File



21. Copy shape from level 9 in utiplanmv80 (sht1) reference to active file making sure the shape remains on level 9 and line code 5. Copy only the shapes around the individual sheets to be plotted within the design file. This shape is needed for plotting using batch plot within microstation.

#### IV. Ownership Sheet

The ownership sheet gives the names and addresses of the adjacent property owners along the highway construction project. The ownership sheet also states the right-of-way, easement and construction permit areas needed from each property owner for the proposed construction project. The property owners are shown by parcel numbers and cross-referenced to the utility plan sheets. Also shown with the ownership sheet are the FHWA/DOT approval date and the date of the last revision to the right-of-way map.

All reference to design files assumes proper DMS naming conventions have been followed. The following procedure assumes a new utility design file is to be made for the ownership sheet, and the ownerships will fit on one sheet. This procedure may need to be repeated if more than one sheet is needed for the complete ownerships of the project.

##### Procedure for creating the utility ownership sheet:

1. Download the file from the ro workgroup in DMS that contains the ownerships usually named 1234roown001. Copy this file to the c:\dgn\ref directory for referencing. Rename the original downloaded file in c:\dgn to 1234utown001, open the file and delete all active elements.
2. Attach the reference file utiplanmV80.ref to the file.
  - o Logical – sht2
  - o Description – utility metric plan sheets
3. Turn off all levels in reference file (sht2) except for:
  - o Level 25 – R/W Authorization
  - o Level 49 – utility designation (left border)
  - o Level 51 - utility project information block (right side of sheet)
4. Turn off all levels except 1-4 in planm.ref (sht1) reference file.
5. Turn off display of reference metrwpl.ref (sht).
6. Attach utilityV8\_0 color table to active design file.
7. In active file turn on level symbology setting from view attributes dialog. Go to settings – level – symbology and turn off all overrides in active design file then save settings.
8. Place cell *plnsht* from utilityV8\_0 cell library and fill in project information data along right hand side of sheet.
9. Change color of all active elements in design file to color 0.
10. Place cell *owner* from utilityV8\_0 cell library and drop status on cell.
11. Attach as reference the original file from c:\dgn\ref containing the ownerships 1234roown001. Clip bound the reference to show only the owners and ownership areas and information, (everything but the page numbers) adjust as needed to fit *owner* cell and display information clearly.
  - o Logical – rw1
  - o Description – ownerships
12. Delete all unnecessary lines from the ownership cell (*owner*) and fill in utility plan sheet numbers.

13. Copy and rename the reference file attachment (rw1) to:
  - Logical – rw2
  - Description – authorization
14. Adjust the clip boundary to show only the FHWA/DOT approval date and map-revised date, move if necessary to display in the designated box.
15. Open reference file dialog and override colors in all references to color 0.
16. In reference file update sequence dialog box, change sequencing as follows:
  - 1) Plan Sheet Borders (sht1)
  - 2) Utility Plan Sheet (sht2)
  - 3) Active design file
  - 4) Ownerships (rw1)
  - 5) Authorization (rw2)
17. Copy shape from level 9 in utiplanmv80 (sht2) reference to active file making sure the shape remains on level 9 and line code 5. Copy only the shapes around the individual sheets to be plotted within the design file. This shape is needed for plotting using batch plot within microstation.

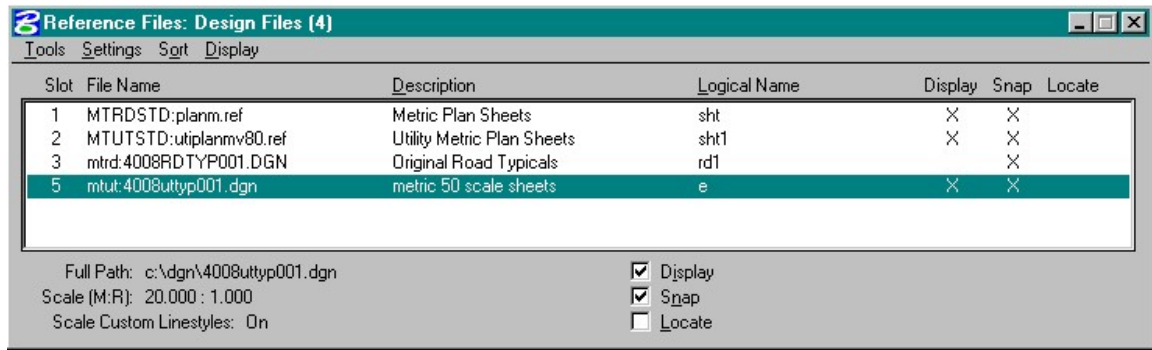
## V. Typical Sections

One or more typical sections are required for each set of plans. Typical sections are used to illustrate the cross section for a roadway section, the basis for surfacing quantities, roadway widths for tangent and superelevated sections, and cut and fill slope rates. Typical sections also show roadside ditches, curbed and uncurbed sections, median widths, sidewalks, driving lanes, shoulder widths, turn lanes, and other roadway surface features.

Note all reference to design files assumes proper DMS naming conventions have been followed. The following procedure assumes a new utility design file is to be made for the typical sections, and the typical sections will fit on one sheet.

### Procedure for creating the utility typical sections:

1. Download the file from the rd workgroup in DMS that contains the typical sections usually named 1234rdtyp001. Copy this file to the c:\dgn\ref directory for referencing. Rename the downloaded file in c:\dgn to 1234uttyp001, open the file and delete all active elements.
2. Attach the reference file utiplanmV80.ref to the file.
  - o Logical – sht1
  - o Description – utility metric plan sheets
3. Turn off all levels in reference file (sht1) except for:
  - o Level 41, 42, 43 – half sheet split lines sheets 1,2 & 3 (if needed)
  - o Level 49 – utility designation (left border)
  - o Level 51, 52, 53 - utility project information blocks sheets 1, 2 & 3
4. Turn off all levels except 1-4 in planm.ref (sht) reference file.
5. Attach utilityV8\_0 color table to active design file.
6. In active file turn on level symbology setting from view attributes dialog box. Go to settings – level – symbology and override color in active design file to 0 then save settings
7. Place cell *plnsht* from utilityV8\_0 cell library and fill in project information data along right hand side of sheets.
8. Attach as reference the file from c:\dgn\ref containing the typical sections 1234rdtyp001. Clip bound the reference file around the 1:50 scale sheets.
  - o Logical – rd1
  - o Description – original road typicals
9. Copy typical section elements from reference file (rd1) into active file 1234uttyp001 and turn off display of reference file (rd1).
10. Open reference file dialog and rename reference 1234rdtyp001, metric 50 scale sheets, (e) to active design file name 1234uttyp001. Typical sections should now be displayed in the main plotting sheets.



11. Adjust elements in 1:50 scale sheets to display properly and clearly in the main plotting sheets.
12. Open reference file dialog and override colors in all references to color 0.
13. Copy shape from level 9 in utiplanmv80 (sht1) reference to active file making sure the shape remains on level 9 and line code 5. Copy only the shapes around the individual sheets to be plotted within the design file. This shape is needed for plotting using batch plot within microstation.

Changes to the typical sections by the design section will not be automatically updated in the utility typical section file. If changes are made to the typical sections then active elements in the 1:50 scale sheet will need to be deleted, the reference (rd1) will need to be turned on and items 9 & 11 redone.

## VI. Detail Sheets

Detail sheets are used for those items that require more specific information than can be adequately described on the plans/profile sheets. Details in the utility plans may include: detours, rumble strips, drainage details, signing, electrical, or geometric details. Mass diagrams are not included with the utility plans. Each project will have its own unique set of details and inclusion of each detail is determined on a project-by-project basis.

All reference to design files assumes proper DMS naming conventions have been followed. The following procedure assumes a new utility design file is to be made for the details, and the details will fit in one design file.

### Detail sheet no.1 – Pipe detail

1. Download the file from the rd workgroup in DMS that contains the details usually named 1234rddet001. Copy this file to the directory c:\dgn\ref for referencing. Rename the original downloaded file in c:\dgn to 1234utdet001, open the file and delete all active elements.
2. Attach the reference file utiplanmV80.ref to the file.
  - o Logical – sht1
  - o Description – utility metric plan sheets
3. Turn off all levels in reference file (sht1) except for:
  - o Level 41, 42, 43 – half sheet split lines sheets 1,2 & 3 (if needed)
  - o Level 49 – utility designation (left border)
  - o Level 51, 52, 53 - utility project information blocks sheets 1, 2 & 3
  - o Level 61, 62, 63 – detail title block sheets 1, 2 & 3
4. Turn off all levels except 1-4 in planm.ref (sht) reference file.
5. Attach utilityV8\_0 color table to active design file.
6. In active file turn on level symbology setting from view attributes dialog box. Go to settings – level – symbology and override color in active design file to 0 then save settings
7. Open reference file dialog and override reference file level color symbology to color 0 in file (sht) & (sht1) references.
8. Place cell *plnsht* from utilityV8\_0 cell library and fill in project information data along right hand side of sheets.
9. Attach as reference the file from c:\dgn\ref containing the details 1234rddet001. Clip bound the reference file around sheet 1 or portion of sheet 1 depending on the detail.
  - o Logical – rd1
  - o Description – pipe detail (name of detail)
10. Override reference file level color symbology to color 0 (rd1).
11. If other references are displayed with the detail set level symbology color override on those references to color 0. Unless some items would be more clearly displayed using gray scale then set reference level color symbology to color 32 for those levels.
12. If it is determined that utilities should be displayed along with the detail then:
  - 1) Attach the file containing utilities usually 1234utsue001
    - o Logical – ut1

- Description – Utilities
- 2) Move, scale, rotate and clip bound the reference to position and display correctly on the detail.
- 13. Turn off all levels in (ut1) except for the utility levels 30-36, open reference file dialog level symbology and override level colors to:
  - 30 – color 3 Red, Electrical
  - 31 – color 20 Gold, Gas
  - 32 – color 0 White, Hazards
  - 33 – color 2 Green, Sanitary and Storm Sewer
  - 34 – color 5 Purple, Television
  - 35 – color 6 Orange, Telephone
  - 36 – color 1 Blue, Water
- 14. Make any final adjustments to detail and detail references to display and print properly.

#### Detail sheet no. 2 – Detour

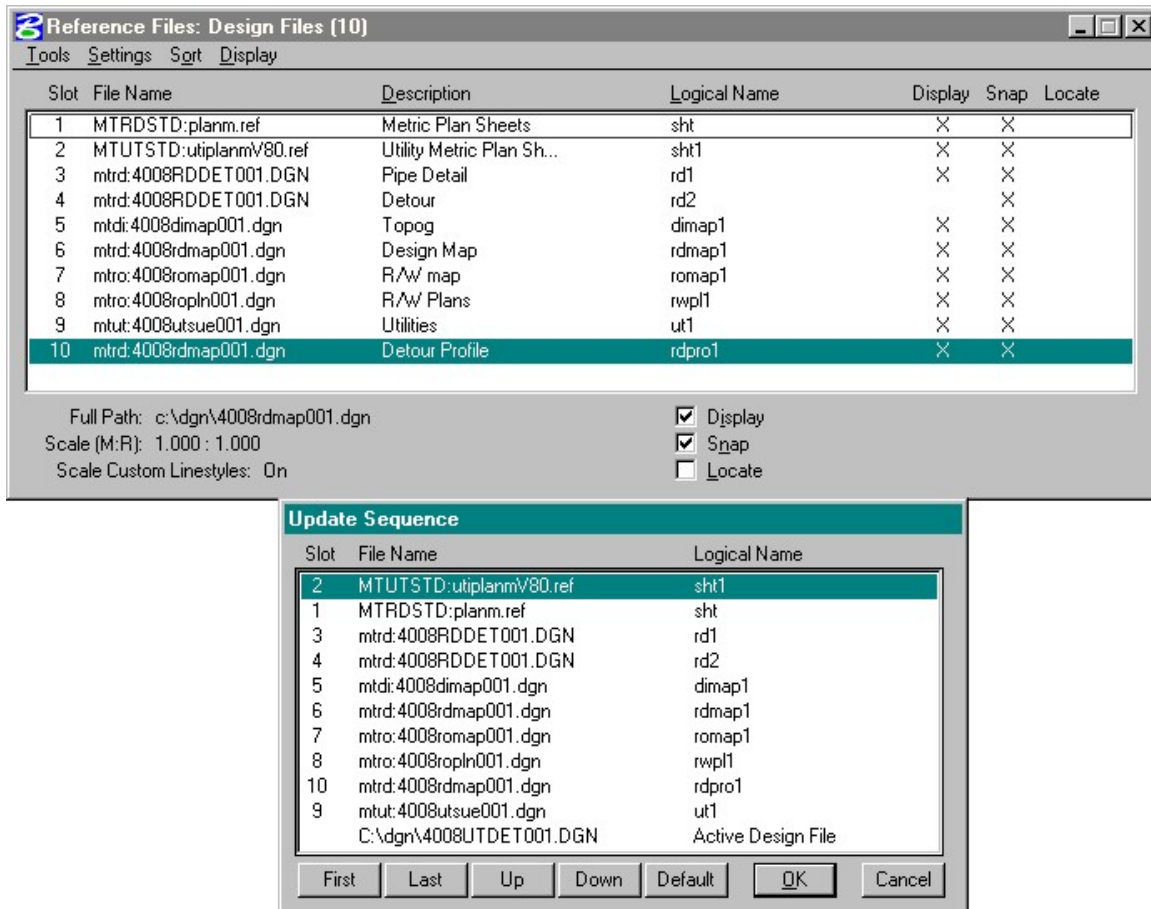
In this example the following is assumed:

- The following reference files are attached to the original detour detail from the rd workgroup:
  - 1234rdmap001 – *design*, logical (rdmap1)
  - 1234rdmap001 – *profile*, logical (rdpro1)
  - 1234dimap001 – *topog*, logical (dimap1)
  - 1234romap001 – *R/W lines*, logical (romap1)
- Construction limits for the detour are on level 34 in the design map file and levels 5 & 6 contain the detour centerline and annotation.
- This is sheet 2 of the detail sheet file 1234utdet001.
- Above and below ground utilities are in file 1234utsue001.
- 15. In reference file attachment utiplanmV80 (sht1):
  - Turn off level 42 – half sheet split lines sheet 2
  - Turn on level 12 – profile grid sheet 2
  - Override reference color symbology to color 32 for level 12
- 16. Attach as reference the file from c:\dgn\ref containing the details 1234rddet001.  
Clip bound the reference file around sheet 1 or portion of depending on the detail.
  - Logical – rd2
  - Description – Detour (name of detail)
- 17. Clip bound reference to display sheet 2 – detour elements.
- 18. Copy all detour elements from (rd2) including profile notes, text and elevations to active design file.
- 19. If necessary move all detour references to fit on sheet usually left 30 (*dl=-30*).
- 20. Adjust all active elements to display properly in active file. Delete elevation text displayed along right side of profile portion of detail sheet.
- 21. If title block is used clip mask profile grid (sht1) around title block. Move title block text if necessary.
- 22. Turn display off for reference file (rd2).
- 23. Open reference file dialog and in reference (rdmap1) adjust as follows:
  - Turn off level 4 – Mainline curve annotation

- Turn on levels 5 & 6 – Detour centerline and annotation
  - Turn on level 34 – detour construction limits.
24. Open reference file level symbology dialog and override color symbology to color 0 in reference file (rdmap1) except:
- 3 (mainline centerline) – color 32
  - 33 (mainline construction limits) – color 32
  - Any other level that would be better displayed with color 32 (gray).
25. Override level color symbology in file (dimap1) to color 32 except for any levels that would be better displayed with color 0 (black).
26. If utilities are also included in the dimap turn off the levels containing the utilities usually levels 30 – 36.
27. Open reference file levels dialog box for reference file (romap1) and turn off all levels except for:
- 16 – Section lines
  - 30 – Existing R/W
  - 31 – Proposed R/W
  - 34 – Property and Lot lines
  - 35 – Interior section lines
  - 36 – Construction permit lines
  - 38 – Proposed easements
  - 40 – Railroad R/W
28. Override reference level color symbology to color 0 in (romap1) except for levels 16, 34 & 35, which are overridden to color 32.
29. If right-of-way callouts and dimensions are to be shown on the detour detail, download and attach as reference the appropriate file from the ro workgroup (ie. 1234ropln001).
- Logical – rwpl1
  - Description – R/W plan
30. Move and adjust as necessary to display properly on the detour detail.
31. Open reference file dialog and turn off all levels except:
- 28 – existing R/W & easement text
  - 28 – existing R/W & easement calls
  - 32 – new R/W & easement calls
  - 37 – construction permit text
32. Override reference file color level symbology in (rwpl1) to color 0.
33. Copy reference file attachment (rdmap1) and rename to file 1234utsue001.
- Logical – ut1
  - Description – Utility map
34. Turn off all levels in (ut1) except for the utility levels 30-36, open reference file dialog level symbology and override level colors to:
- 30 – color 3 Red, Electrical
  - 31 – color 20 Gold, Gas
  - 32 – color 0 White, Hazards
  - 33 – color 2 Green, Sanitary and Storm Sewer
  - 34 – color 5 Purple, Television
  - 35 – color 6 Orange, Telephone



- 36 – color 1 Blue, Water
35. Change update sequence in reference file dialog to display in order:
- 1) Planm.ref (sht)
  - 2) Utiplanm.ref (sht1)
  - 3) 1234dimap001 (dimap1) – topog
  - 4) 1234rdmap001 (rdmap1) – design
  - 5) 1234romap001 (romap1) – R/W lines
  - 6) 1234ropln001 (rwpl1) – R/W text
  - 7) 1234rdmap001 (rdpro1) – design profile
  - 8) 1234utsue001 (ut1) – utilities
  - 9) active design file



36. Copy shape from level 9 in utiplanmv80 (sht1) reference to active file making sure the shape remains on level 9 and line code 5. Copy only the shapes around the individual sheets to be plotted within the design file. This shape is needed for plotting using batch plot within microstation.

## VII. Plan\Profile Sheets

The intent of the utility plan\profile sheets is to clearly distinguish the relationship between construction, right-of-way and other design features with the utilities located along or adjacent to the proposed highway construction project. The utility plan/profile sheet resembles the department's standard plan/profile sheet but with the profile portion of the sheet reduced, expanding the plan portion of the sheet.

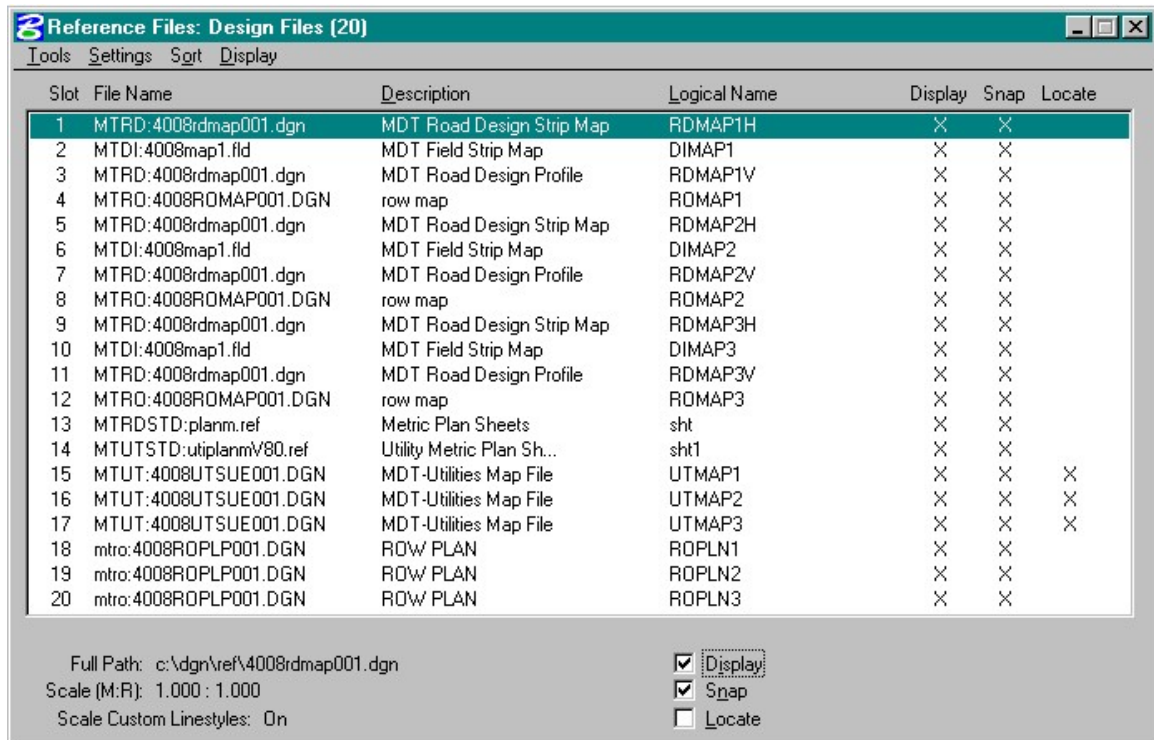
As a general rule in the utility plan/profile sheets, existing topography (buildings, trees, ex. r/w, etc.) is shown with gray lines, new items (const. limits, pipes, new r/w etc.) are shown with black lines and all utilities are shown with the proper color coded lines.

Note all reference to design files assumes proper DMS naming conventions have been followed. The following procedure assumes a SUE survey was performed locating all above and below ground utilities and all mapping and survey files follow CADD standards with regards to levels. The procedure also assumes a new utility design file is to be made for the plan sheets, and the plan sheets will fit in one design file. The procedure will need to be repeated or modified if more than one plan/profile sheet design file is needed.

### Procedure for creating utility plan\profile sheets:

1. Download the plan\profile sheets from the rd workgroup directory in DMS to the c:\dgn directory. Copy this file to the c:\dgn\ref directory for referencing. Check to make sure all the following files were downloaded:
  - A. In the c:\dgn directory:
    - o 1234rdplp001 (rd workgroup plan\profile sheets)
  - B. In the c:\dgn\ref directory:
    - o 1234dimap001 (district field survey file)
    - o 1234phmap001 (photogrammetry survey file)
    - o 1234rdmap001 (road design map file)
    - o 1234romap001 (R/W map file)
    - o 1234utsue001 (SUE map file)
    - o 1234ropln001 (ro workgroup plan sheets)
  - C. The above files represent a typical reconstruction project. Some projects may require more or less files and will not be specifically covered with these procedures.
2. Open each map or survey file and check for level conformance according to established CADD standards. If discrepancies are found notify the responsible unit or area to make the corrections. In some circumstances a separate map file can be made (1234utmap001) that will allow transparent corrections of map or survey files to be made. Discretion must be exercised when using this method to insure the integrity of the original file is not affected.
3. Rename the original plan\profile sheet in the c:\dgn directory from 1234rdplp001 to 1234utplp001. Open file and turn on level symbology in view attributes dialog box then save settings.
4. Attach utilityV8\_0 color table to active design file. Open reference file dialog and attach reference file utiplanmV80 as reference file.

- Logical – sht1
  - Description – utility metric sheets
5. Turn off all levels in utiplanm (sht1) except:
    - 11, 12, 13 - Profile grid sheet 1-3
    - 49 – Utility designation (left border)
    - 51, 52, 53 – Utility project information blocks
  6. Open reference file dialog level color symbology and override levels in reference file (sht1), 11 – 13 to color 32 (gray) and all other levels to color 0 (white).
  7. Turn off all levels except 1 – 4 in planm.ref (sht) reference file. Override all levels color symbology for reference (sht) to color 0 (white).
  8. Open reference file dialog, check for correct reference file attachments and naming – see example. See CADD standards for correct naming conventions. If reference files are missing or need adjusting, add or make the necessary adjustments.



9. Delete profile elevation text along right side of sheet and project information in the upper right corner of sheets.
10. Attach utilityV8\_0 cell library, place cell *plnsht* and fill in project information along right side of sheet.
11. Inspect profile for placement and if necessary move down to fit profile grid. It may be necessary to split the profile to fit the grid. To do this:
  - 1) In reference file dialog select copy attachment and copy profile (RDMAP1V) one (1) time.
    - Logical – RDMAP1Va
    - Description – MDT Road Design Profile

- 2) Place fence and clip bound around area of original profile (RDMAP1V) to be viewed on profile grid. Move profile down in increments of 20 if necessary.
- 3) Place fence around area of the profile copy (RDMAP1Va) not shown in 1<sup>st</sup> profile (RDMAP1V). Move down in increments of 20 to fit on profile grid.
- 4) Copy profile elevation text, from left side of profile grid and move down same amount as the profile copy (RDMAP1Va) then move to show elevations properly on profile.
12. Open reference file dialog and go to settings - level symbology - color and override all profile levels to color (0) white.
13. Move all profile related notes (e.g., approach notes, guardrail, inlet or outlet ditches etc.) to position on profile grid. Move all pipe notes down to fit sheets, usually 60 down (dl=-60).
14. Visually inspect plan/profile sheets and make adjustments to all notes as necessary for clarity.
15. In reference file dialog open reference files-settings-levels dialog for the survey strip map references (DIMAP\*) and turn on the following levels. See CADD standards for level designation. Number in bracket [] represents the color the level is to be overridden to.
  - o 3 - Sign features [0]
  - o 7 - Generic planimetric features [32]
  - o 9 - Vegetation [32]
  - o 19 - Planimetric break lines [32]
  - o 22 - Natural water line features [32]
  - o 23 - Man-made water line features [32]
  - o 38 - Drainage [32]
  - o 44 - Wetland boundary [32]
16. Open reference file dialog and go to settings - level symbology - color and override levels to the colors shown in brackets [] listed above.
17. If other levels from the survey strip map are to be displayed and plotted, determine the color the particular level or levels should be and make the appropriate adjustments.
18. Repeat if more than one set of survey files are attached.
19. In reference file dialog open reference files-settings-levels dialog for the road design strip map references (RDMAP\*H) and turn on the following levels. See CADD standards for level designation. Number in bracket [] represents the color the level is to be overridden to.
  - o 3 - Design C/L [0]
  - o 4 - Design C/L curve data, annotation [0]
  - o 5 - Detour C/L [32]
  - o 7 - Topography and topography text [32]
  - o 11 - Culverts, storm drains, irrigation features etc. [0]
  - o 13 - Approaches new [0]
  - o 14 - Alternate and side street C/L [32]
  - o 17 - North arrow [0]
  - o 20 - New guardrail [0]
  - o 21 - New sidewalk [0]

- 22 - New curb and gutter [0]
  - 33 - Construction limits [0]
  - 41 - Utility conflict callouts [0]
  - 44 - Wetland boundary [32] if off in DIMAP
  - 47 - Wetland hatching [32]
  - 48 - Wetland impacts boundary [32]
  - 49 - Wetland impacts cross hatching [32]
20. Open reference file dialog and go to settings - level symbology - color and override levels to the colors shown in brackets [] listed above.
21. If other levels from the road design strip map are to be displayed and plotted, determine the color the particular level or levels should be and make the appropriate adjustments.
22. In reference file dialog open reference files-settings-levels dialog for the right-of-way strip map references (ROMAP\*) and turn on the following levels. See CADD standards for level designation. Number in bracket [] represents the color the level is to be overridden to.
- 16 - Section lines [32]
  - 30 - Existing R/W lines [32]
  - 31 - Proposed R/W & Easement lines [0]
  - 34 - Property lines, lot lines [32]
  - 35 - Interior section lines [32]
  - 36 - Construction permit lines [0]
  - 38 - Proposed easement lines [0]
  - 40 - Existing Railroad R/W lines [0]
23. Open reference file dialog and go to settings - level symbology - color and override levels to the colors shown in brackets [] listed above.
24. In reference file dialog open reference files-settings-levels dialog for the right-of-way plan sheet references (ROPLN\*) and turn on the following levels. See CADD standards for level designation. Number in bracket [] represents the color the level is to be overridden to.
- 17 - Township & range callouts [0]
  - 19 - 1/16 section callouts, Government lots [0]
  - 23 - Railroad R/W stationing (for easement) [0]
  - 25 - Parcel numbers [0]
  - 27 - Railroad R/W dimensions [0]
  - 28 - Existing R/W & easement dimensions [0]
  - 29 - Existing R/W & easement callouts [0]
  - 32 - New R/W & easement callouts [0]
  - 33 - R/W +00 callouts [0]
  - 34 - Ownership dots [32]
  - 37 - Construction permit callouts [0]
  - 39 - Other easement text [0]
  - 43 - Access control information [0]
  - 44 - Beg & end acquisition note [0]
25. Open reference file dialog and go to settings - level symbology - color and override levels to the colors shown in brackets [] listed above.

26. In reference file dialog open reference files-settings-levels dialog for the utility SUE map references (UTMAP\*) and turn on the following levels. See CADD standards for level designation. Number in bracket [] represents the color the level is to be overridden to.
  - 30 – Electrical [3] Red
  - 31 – Gas [20] Gold
  - 32 – Hazards, Misc. utilities [0] White
  - 33 – Sanitary and Storm Sewer [2] Green
  - 34 – Television [5] Purple
  - 35 – Telephone [6] Orange
  - 36 – Water [1] Blue
27. Open reference file dialog and go to settings - level symbology - color and override levels to the colors shown in brackets [] listed above. It should be noted that gas lines should be shown in yellow, but when plotting on white sheets the yellow does not show well so the color gold is used instead.
28. Open reference file dialog and go to settings – update sequence and change update sequence as follows:
  - 1) Planm.ref (sht) – plan sheet border
  - 2) Utiplanm.ref (sht1) – utility plan sheets
  - 3) 1234map1.fld (dimap\*) – survey strip maps
  - 4) 1234rdmap001.dgn (rdmap\*h) – road design strip map
  - 5) 1234romap001.dgn (romap\*) – R/W strip map
  - 6) 1234ropln001.dgn (ropln\*) – R/W plan sheets
  - 7) 1234rdmap001.dgn (rdmap\*v\*) – road design profile
  - 8) 1234utsue001.dgn (utmap\*) – SUE or utility strip map
  - 9) Active design file
29. Review the plans for clarity make appropriate changes or adjustments to the utility plans. It may be necessary to copy items from the various strip maps and/or plans then adjust for clarity or to reduce the amount of clutter to make the utility plans more readable. When items are copied into the active design file it is necessary to turn off the level in the reference from where the item(s) originated. Care must be exercised when doing this so that other information is not turned off inadvertently.
30. Place utility conflict callouts on the utility plans. See **identifying utility conflicts** for direction on how to identify the conflicts. Utility conflicts should be clearly labeled and placed on level 41 of the utility plan/profile sheets.
  - 1) Lateral conflicts are called out by station range and placed on the utility plan sheet near the top of the plan portion of the utility plan. The note should identify the station range (beginning and ending station of the conflict), whether it is left, right, or on both sides of design centerline and the type of utility. This same note should be placed on each plan sheet where the utility in conflict exists.
  - 2) Spot conflicts are called out by station and offset from the design centerline and placed as near as possible to where the utility in conflict exists. Spot conflicts are placed perpendicular to the design centerline and labeled with a circle around the utility with a leader line from it identifying the station and

offset. To provide uniformity in the plan sheets there are two cells (*callrt* & *calllt*) in the utilityv8\_0 cell library that should be used for labeling the spot conflicts.

- 3) Other conflicts are called out the same way as either lateral conflicts or spot conflicts dependent on circumstances or conditions and placed in a manner to clearly be seen on the plan sheets.
  - 4) Utility crossing notes are usually placed by the design unit and should include design centerline crossing station, height of crossing or depth of bury, and number of wires or size of pipe or line if known. Crossing notes should be placed near the top of page on level 9 in the plan\profile sheet file and should be checked for accuracy and completeness and modified if necessary.
  - 5) Most conflicts are identified by the design unit and placed on level 41 in the design unit's strip map (rdmap\*h). The labels in this strip map should be turned off after final conflicts are identified and placed in the plan\profile sheets.
31. It should be noted that by coping the rd workgroup plan\profile sheets pipe notes, elevations and other items from step 9, 13 & 14 will need to be updated if changes to the road design plan\profile sheets are made.
32. Copy shape from level 9 in utiplanmv80 (sht1) reference to active file making sure the shape remains on level 9 and line code 5. Copy only the shapes around the individual sheets to be plotted within the design file. This shape is needed for plotting using batch plot within microstation.

## VIII. Identifying Utility Conflicts

The utilities identified as conflicts on the utility plan\profile sheets are utility conflicts with respect to the construction limits and other construction related items. MDT's utility agents use the utility plans to meet with the individual utility companies and determine the extent of each utility companies involvement with the construction project. Right of way both existing and new needs to be identified prior to the utility PIH to determine involvement with respect to private easement, highway R/W, and necessary room for relocating the affected utility.

### 1. Lateral conflicts

Lateral conflicts are defined as those utilities that traverse laterally or parallel to the existing roadway. The utilities involved are typically underground utilities such as telephone, fiber cable, gas etc. The utility can be on one side or both sides of the roadway with various crossings. To identify the conflict:

- Open utility map file (1234utsue001.dgn) make sure the latest road design strip map with construction limits is attached and level 33 turned on.
- Identify where the utility first crosses into the construction limits then follow utility and determine where the utility last crosses out of the construction limits. Note whether this is left, right or on both sides of design centerline.
- If the utility crosses in and out or weaves through the construction limits short segments should be combined into one note. As a general rule gaps less than 60 meters in length can be combined.
- If a pedestal is located just prior to or just after the utilities lateral conflict adjust the lateral conflict extending it to the pedestal or pedestals.
- Go to the utility plan\profile sheets and place note indicating the conflict. See step 30 of utility plan\profile sheets procedure.

### 2. Spot conflicts

Spot conflicts are defined as a conflict existing at a specific location. The utilities typically involved include power, telephone, san sewer, etc. and are usually poles, pedestals, manhole covers etc. The conflict is called out by station and offset from design centerline. To identify the conflict:

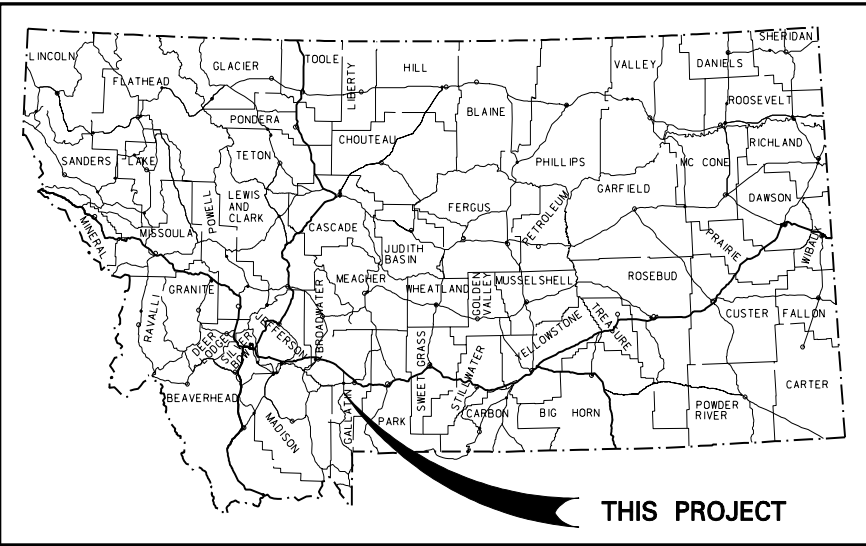
- Open the utility plan\profile sheets (1234utplp00\*) making sure the latest road design strip map file is attached and construction limits (lv.33) and the utility conflicts (lv.41) are turned on.
- Visually inspect the plan sheets for pedestals, poles etc. that are inside the construction limits. When conflicts are found place cell (*calllt or callrt*) from the utilityV8\_0 cell library perpendicular to centerline and identify the conflict and its relationship to design centerline by station and offset.
- If the conflict is called out in the road design strip map the station and offset can be copied from it once checked for accuracy. If the conflict is not included in the design map then a station and offset will need to be measured from the design centerline.
- Station callouts should be rounded to the nearest meter and offset distances to the nearest tenth (0.1) meter.



- Visually inspect the plan\profile sheets for conflicts with other construction items such as ditches, approaches, pipes etc. that may cause a conflict with the utilities. Identify these conflicts using the method describe above.
3. Other conflicts  
Other conflicts can be defined as utilities having conflicts with the construction project but are not defined as either a lateral or spot conflict. Examples might be a telephone cable attached to an existing bridge that is to be replaced, or a gas line running down a county road to be resurfaced but bid as lump sum, with construction limits not computed or shown. These conflicts should be shown in the utility plan sheets and good judgment exercised when defining them, either like a lateral or spot callout.
4. Utility crossings  
Utility crossings may or may not be defined as a conflict but in either case will be called out on the utility plans. Overhead utility crossings should be called out by the station the utility crosses the design centerline, the number of wires at the crossing, and clearance measured from the centerline of the existing roadway to the lowest wire. If the information is unknown it should be stated as unknown in the utility crossing note. Underground utility crossings should be called out by station the utility crosses the design centerline, depth the utility is buried from the existing roadway to the top of the utility and number of wires or cables if known. Underground gas, water, sewer, duct systems etc. should include station the utility crosses design centerline, depth the utility is buried from the existing roadway to the top of utility and also include the size of utility if known. See CADD standards and RDM section 4.3.10.4(8) for correct placement of utility crossing notes. Utility crossings also need to be depicted on the cross sections see RDM section 4.3.11.2(2) and fig 4.4 T-1.

## **IX. Example Plan Sheets**

The following 11 X 17 sheets are provided as a visual aid for the preparation of the utility plans package. They are from various projects and are representative of a typical utility plans package



# MONTANA DEPARTMENT OF TRANSPORTATION

## UTILITY PLAN OF

### FEDERAL AID PROJECT NH 50-2(38)74

### TURNBAYS - SOUTH OF GALLATIN GATEWAY

DESIGN	DATA
1999 A.D.T. =	4540
2019 A.D.T. =	9040
D.H.V. =	990
T. =	9.3%
V. =	110 km/h
ESAL'S =	349.28 D
GROWTH RATE =	3.5 ANNUALLY

LETTING DATE - \_\_\_\_\_

#### PLAN LEGEND

CENTERLINE (C) OR PROJECTED LINE	
PROPOSED RIGHT OF WAY LINE	
EXISTING RIGHT OF WAY LINE	
RAILROAD RIGHT OF WAY LINE	
EXISTING ACCESS CONTROL	
FULL ACCESS CONTROL	
LIMITED ACCESS CONTROL	
OWNERSHIP BOUNDARY	
SECTION LINE	
SECTION CORNER	
1/4 SECTION CORNER	
RIGHT OF WAY MONUMENT	
PROPERTY CORNER PIN	
PARCEL NUMBERS	
PRESENT TRAVELED WAY (P.T.W.)	
APPROACH: EXIST. - PROPOSED	
FENCE LINE	
GATE IN FENCE	
CATTLE GUARD: EXIST. - PROPOSED	
BRIDGES	
RAILROADS	
EXISTING GUARDRAIL	
PROPOSED GUARDRAIL	
EXISTING DITCH	
CHANNEL CHANGES	
EXISTING CULVERT	
PROPOSED CULVERT	
OUTLET DITCH	
INLET DITCH	
POWER POLE IN PLACE	
TELEPHONE POLE IN PLACE	
LIGHT POLE - GUY POLE	
PEDESTALS	
MANHOLES	
VALVES	
FIRE HYDRANT	
FIBER CABLE	
GAS	
POWER	
TELEPHONE	
TELEVISION	
WATER	
SANITARY SEWER	
UTILITY POLES IN POSSIBLE CONFLICT	

UNDERGROUND	FO	FO
UNDERGROUND	GAS	GAS
OVERHEAD	PWR	PWR
UNDERGROUND	PWR	PWR
OVERHEAD	TEL	TEL
UNDERGROUND	TEL	TEL
OVERHEAD	TV	TV
UNDERGROUND	TV	TV
EXISTING	W	W
PROPOSED	W	W
EXISTING	SAN	SAN
PROPOSED	SAN	SAN

ASSOCIATED PROJECT ID.
------------------------

RELATED PROJECTS
F76(4)
NH 50-2(29)70

#### GALLATIN COUNTY

#### 1.6 Kilometers

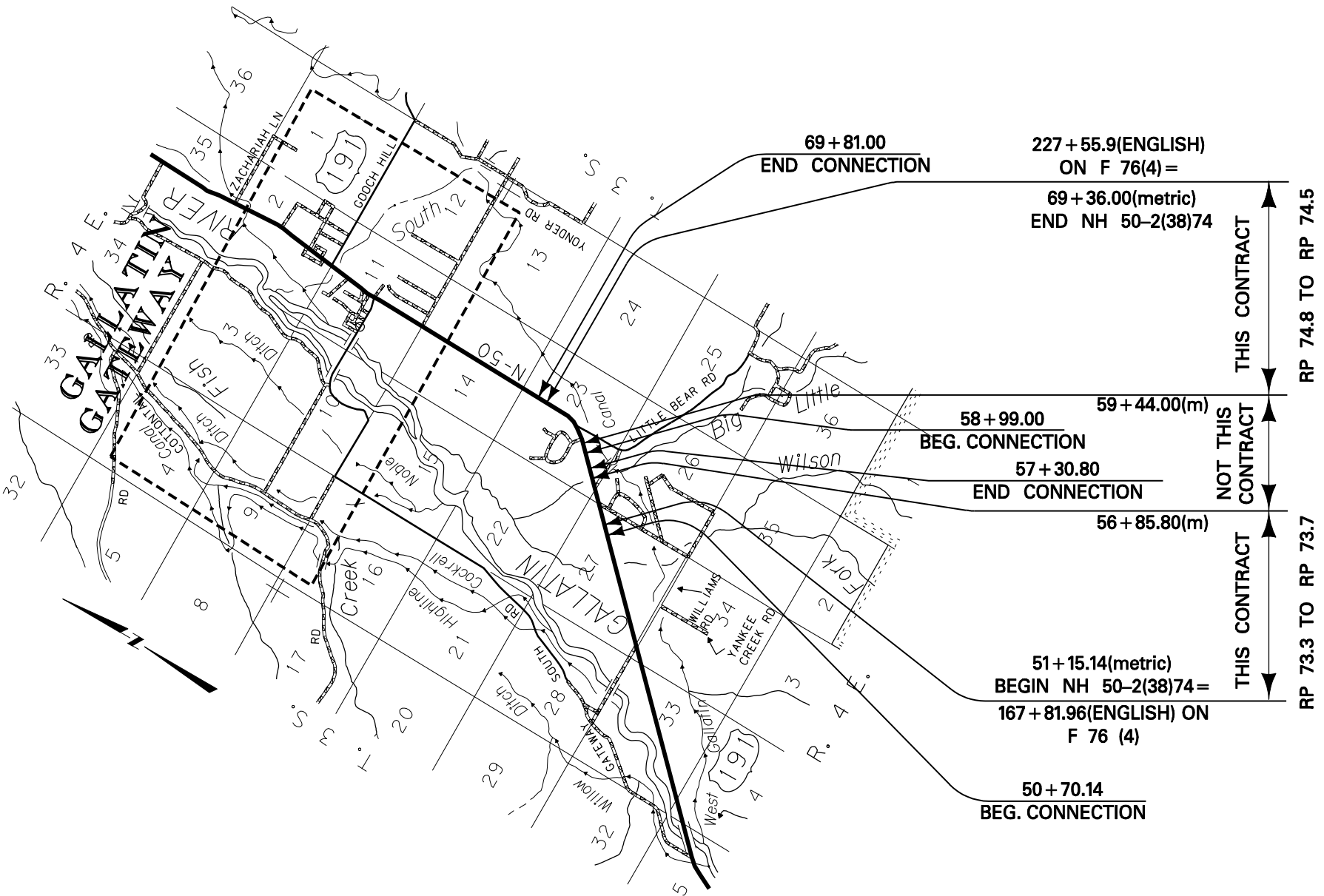
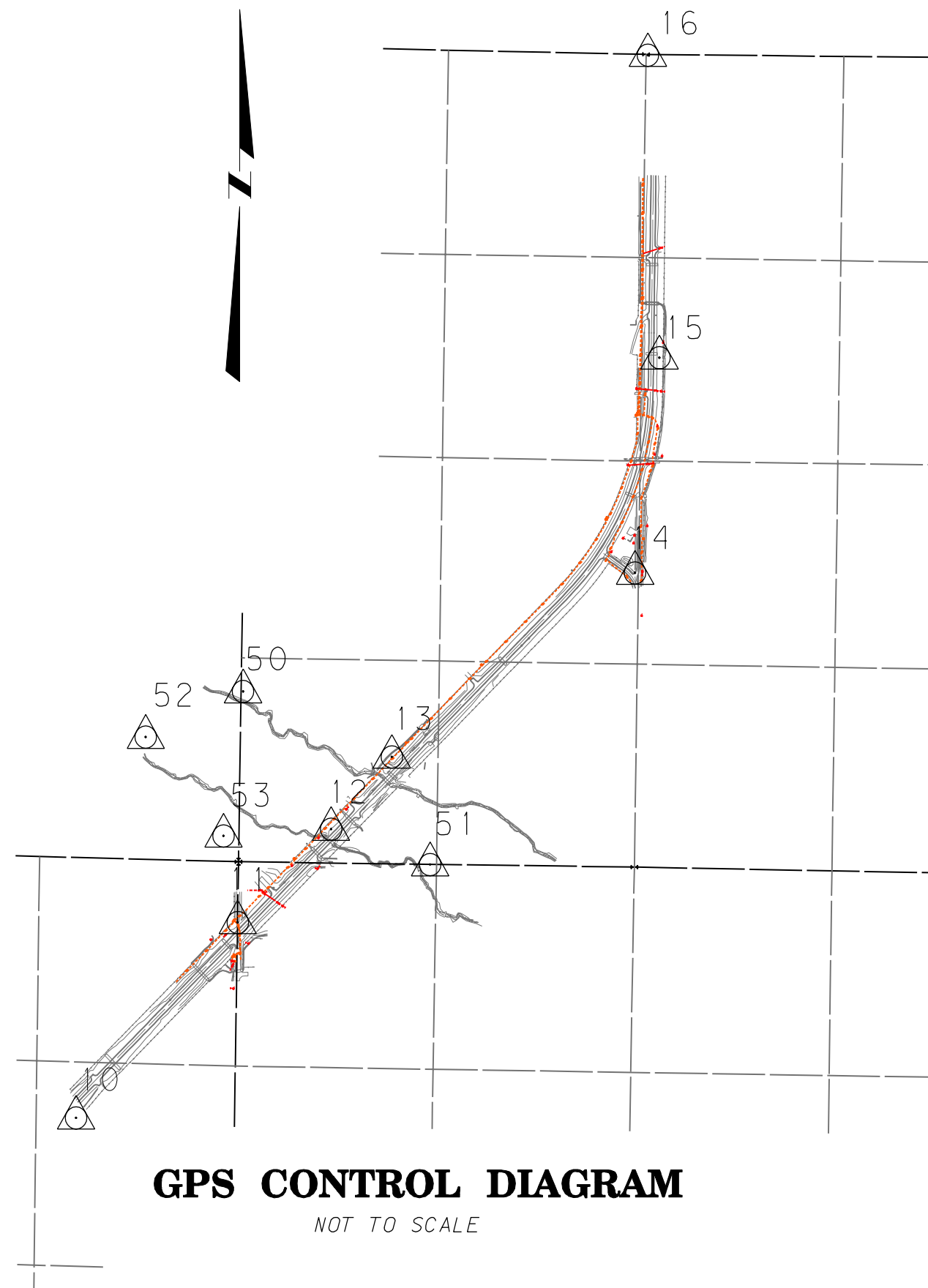


Fig. 1.1



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U5332		
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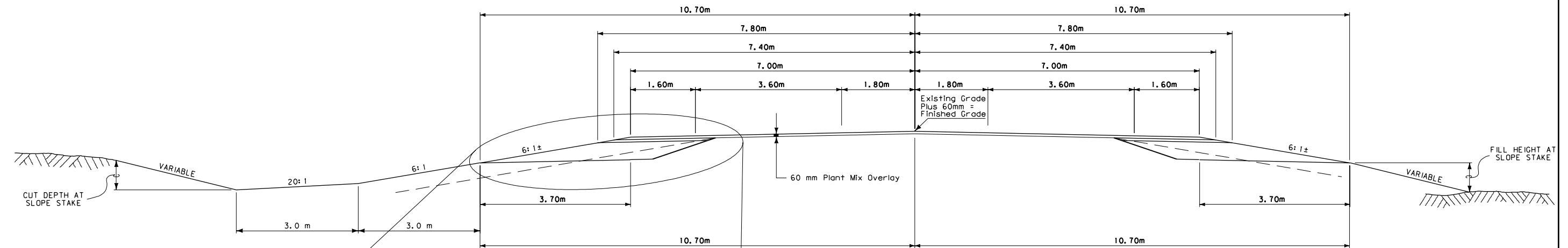


GPS CONTROL ABSTRACT				
POINT NAME/NUMBER	N OR Y COORDINATE	E OR X COORDINATE	POINT ELEVATION	LOCATION AND DESCRIPTION
10	145 955.4740	466 407.6140	1548.747	SET A 50mm MDOT ALUMINUM CAP STAMPED "74-A 2000" MP 74.2 25m RT
11	146 341.1500	466 747.4040	1547.274	SET A 50mm MDOT ALUMINUM CAP STAMPED "74-B 2000" MP 74.5 16m LT
12	146 525.4590	466 927.8580	1550.040	SET A 50mm MDOT ALUMINUM CAP STAMPED "74-C 2000" MP 74.7 12m LT
13	146 646.7830	467 051.9560	1552.532	SET A 50mm MDOT ALUMINUM CAP STAMPED "74-D 2000" MP 74.8 10m LT
14	147 030.9440	467 547.8610	1558.478	SET A 50mm MDOT ALUMINUM CAP STAMPED "74-A 2000" MP 74.1 80m RT
15	147 456.0250	467 597.8630	1551.095	SET A 50mm MDOT ALUMINUM CAP STAMPED "74-B 2000" MP 74.4 18m RT
16	148 053.0260	467 574.4350	0.000	SET A 12mm SPIKE FOR TRAVERSE POINT
50	146 797.0100	466 748.4550	1545.375	SET A 12mm SPIKE FOR TRAVERSE POINT
51	146 455.4980	467 129.9690	1554.814	SET A 12mm SPIKE FOR TRAVERSE POINT
52	146 707.0920	466 549.7220	1539.896	SET A 12mm SPIKE FOR TRAVERSE POINT
53	146 512.1410	466 708.6860	1545.802	SET A 12mm SPIKE FOR TRAVERSE POINT

CENTERLINE COORDINATE TABLE				
STATION	DESCRIPTION	N OR Y COORDINATE	E OR X COORDINATE	REMARKS
48+06.90	POT	145 990.9304	466 407.7978	
62+65.98	SC	147 022.1659	467 439.9248	
64+49.08	PI	147 161.4150	467 558.8266	
66+20.70	CS	147 343.6932	467 576.2220	
67+83.56	POT	147 506.4360	467 581.0784	
71+00.00	POT	147 822.8435	467 585.6116	

NOTE:  
CSF = 0.99946874





DESIGN R VALUE = 30

OVERLAY QUANTITIES											
UNIT	AGGREGATE					UNIT	BITUMINOUS MATERIAL				
	COVER	PLANT MIX					ASPHALT CEMENT		SEAL	TACK	
AREA square meters		0.086				square meters PER STATION			1400	1480	
cubic meters PER STATION		86.40				tons PER STATION	10.08		2.57		
tons PER STATION	19.6	197.6				liters PER STATION				340	

SHOULDER WIDENING QUANTITIES (INCLUDES BOTH SHOULDERS)											
UNIT	AGGREGATE					UNIT	BITUMINOUS MATERIAL				
		PLANT MIX		CR. AGG. COURSE			ASPHALT CEMENT	PRIME			
AREA square meters		0.312				square meters PER STATION					
cubic meters PER STATION		31.2		296		tons PER STATION	3.64	0.77			
tons PER STATION		71.4				liters PER STATION					

Fig. 5. 1



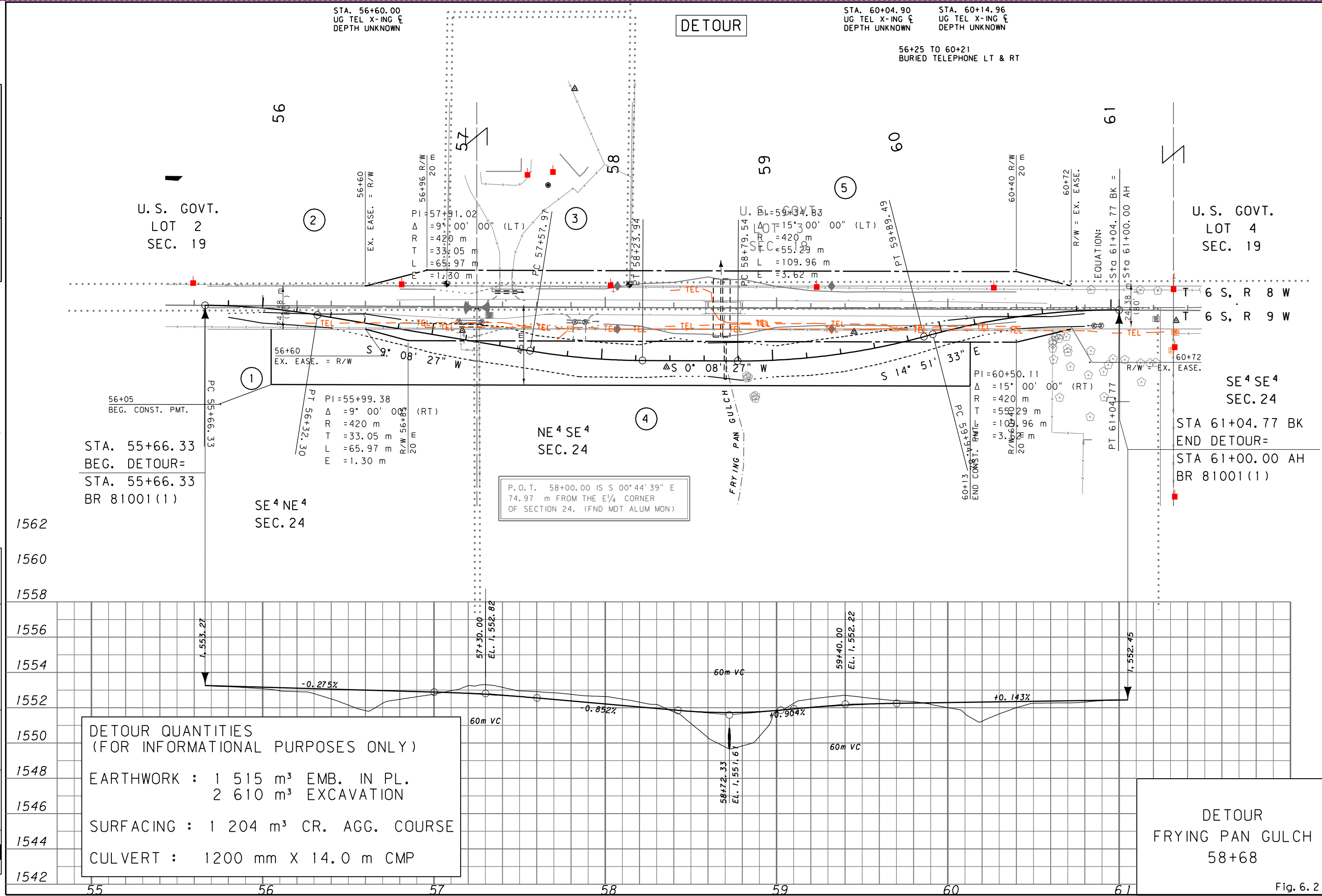




UTILITIES

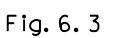
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TOTAL SHEETS	9
SHEET NUMBER	U8
FRYING PAN GULCH-8kmN DILLON	CONTROL NO. 4538
BR 81001(2)	
UTILITY PLAN BEAVERHEAD COUNTY SCALE 1"=1000'	1000' 500' 0'
MONTANA DEPARTMENT OF TRANSPORTATION	MDT serving you with pride

.....\4363UTDET001.DG	DESIGNED BY	
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UTILITY CROSSINGS	
51+54.9	WATER LINE DEPTH UNKNOWN
51+56.1	OH POWER LINE 6.8 m CLR
51+74.7	OH POWER LINE 6.0 m CLR
52+09.0	3-OH PWR & 1-TEL LINE 5.9 m CLR
52+10.1	NAT. GAS LINE DEPTH UNKNOWN
52+11.3	SAN. SEWER DEPTH UNKNOWN
52+14.3	OH TELEPHONE LINE 6.4 m CLR
52+66.7	OH POWER LINE 7.3 m CLR
52+66.7	STORM DRAIN DEPTH UNKNOWN
52+69.4	STORM DRAIN DEPTH UNKNOWN
52+77.1	WATER LINE DEPTH UNKNOWN
52+78.3	OH POWER LINE 6.0 m CLR
53+31.5	UG TELEPHONE DEPTH UNKNOWN

NEW MONUMENT BOXES	
51+50.44	1st AVE. NORTH
52+72.55	2nd AVE. NORTH
53+94.74	3rd AVE. NORTH

ADJUST MANHOLE IN PLACE	
52+14.57	- 4.9 m RT.
53+30.45	- 4.8 m RT.
54+52.53	- 4.7 m RT.

CURB OPENINGS LEFT	
51+95.6	3.6
52+11.1	3.6
53+09.6	3.6
53+16.0	3.6
53+33.3	3.6
53+35.5	3.6
53+44.4	3.6
54+35.5	3.6
54+55.7	3.6
54+63.7	3.6

CURB OPENINGS RIGHT	
51+91.4	3.8
52+11.1	3.8
52+33.3	3.8
53+07.9	3.8
53+25.7	3.8
53+33.6	3.8
53+54.0	3.8
54+48.2	3.8
54+55.7	3.8
54+80.8	3.8

CURB RAMPS	
51+56.8	LT.
51+59.4	LT.
52+63.5	LT.
52+66.0	LT.
52+77.9	LT.
52+81.2	LT.
53+86.5	LT.
53+89.1	LT.
54+00.4	LT.
54+03.0	LT.
51+55.7	RT.
51+59.0	RT.
52+63.8	RT.
52+67.2	RT.
52+78.2	RT.
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53+86.5	RT.
53+89.0	RT.
54+00.4	RT.
54+02.9	RT.

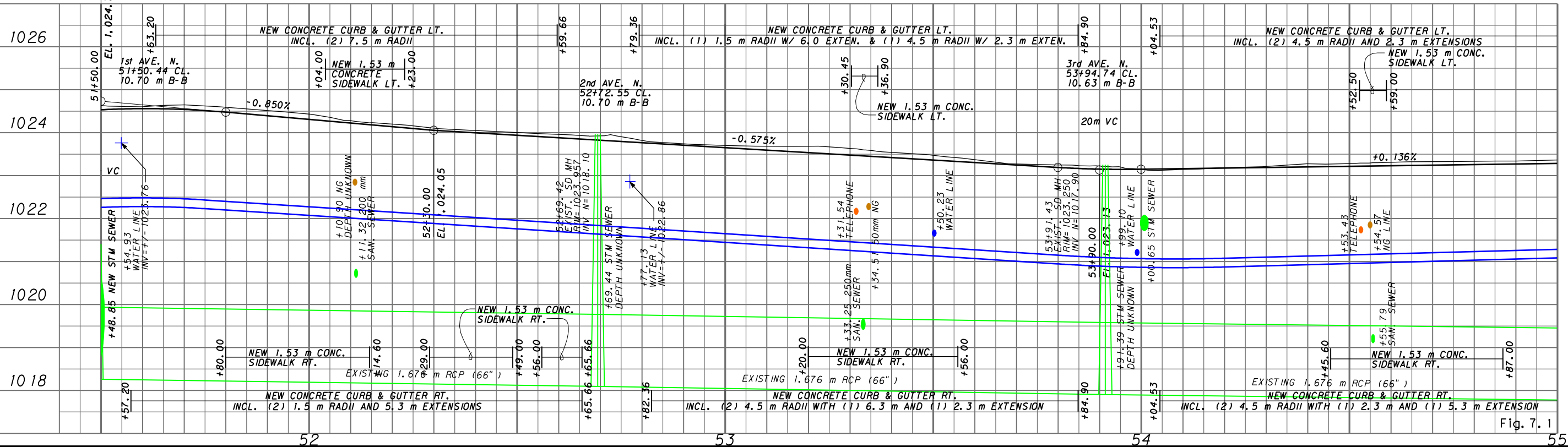
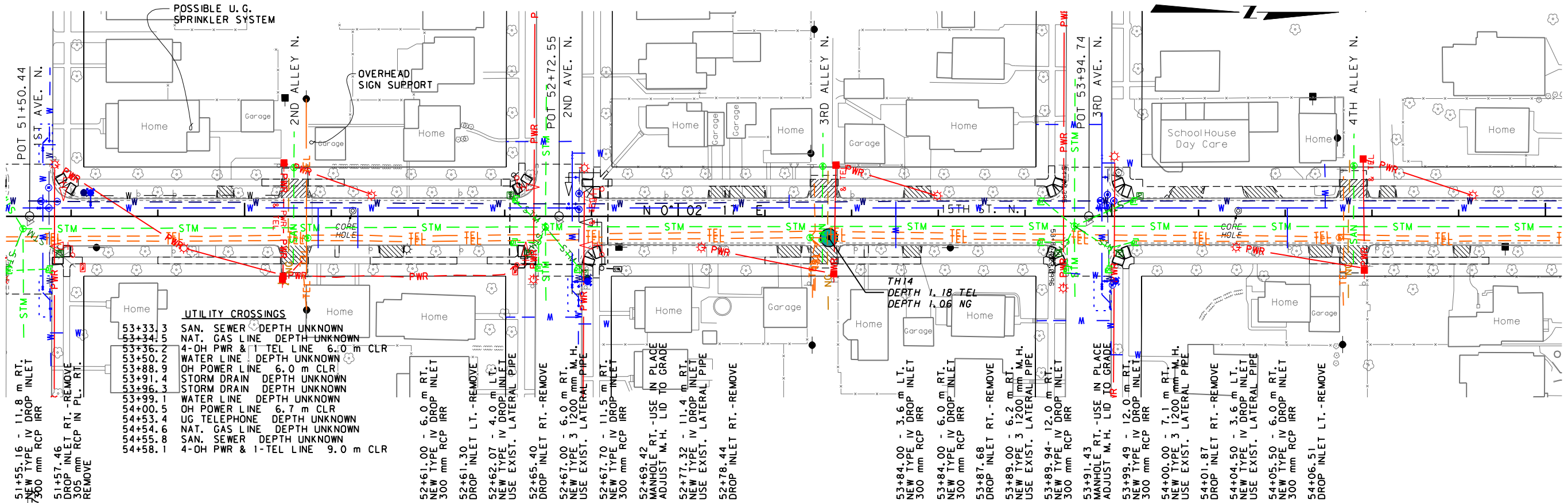


Fig. 7.1

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MDJ

MONTANA DEPARTMENT  
OF TRANSPORTATION

MONTANA  
CADD

UTILITIES

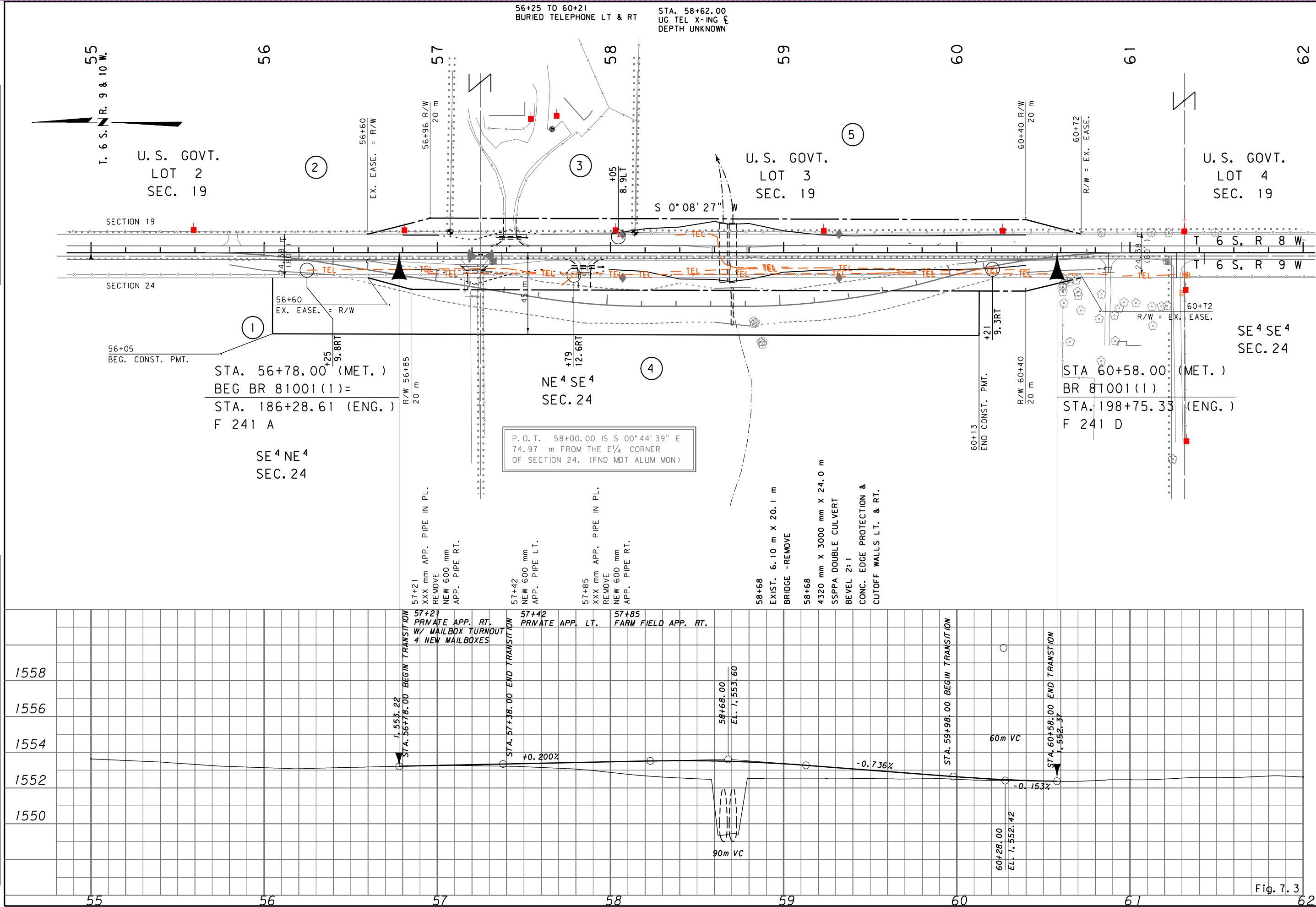


Fig. 7. 3

MDJ

MONTANA DEPARTMENT  
OF TRANSPORTATION

UTILITY PLAN  
BEAVERHEAD COUNTY  
SCALE 1"=1000

FRYING PAN GULCH-8kmN DILLON  
BR 81001(2)

CONTROL NO. 4538

SHEET NUMBER  
U9

TOTAL SHEETS  
9

serving you with pride

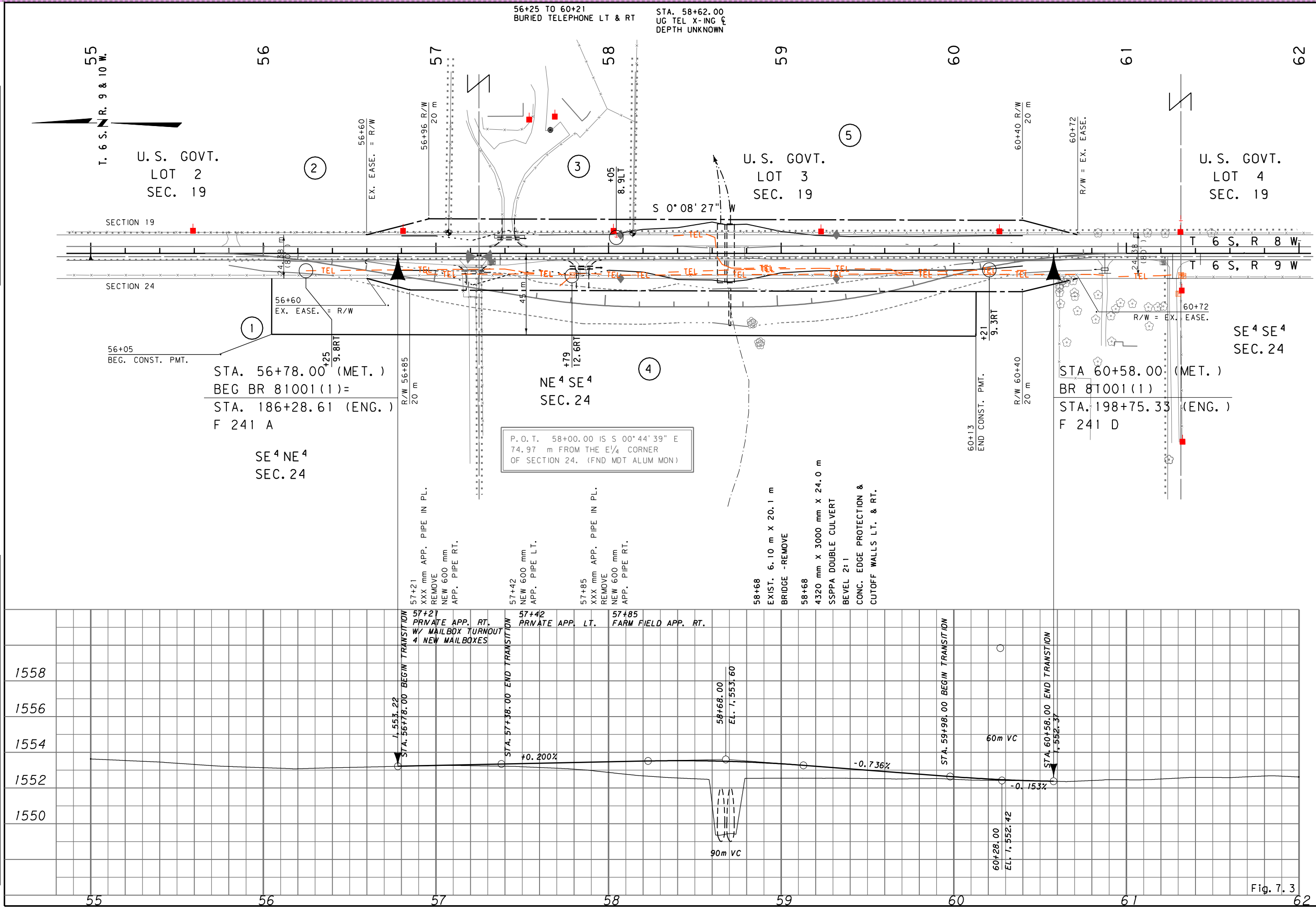


...\\4538UTPLP001.DGN DESIGNED BY	
03/08/04	REVIEWED BY
07:16:22 AM	CHECKED BY
U5332	
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4538r.dpt1.dgn



UTILITIES



MONTANA DEPARTMENT OF TRANSPORTATION

serving you with pride

UTILITY PLAN  
BEAVERHEAD COUNTY  
SCALE 1"=1000

0 50M 100M

**FRYING PAN GULCH-8kmN DILLON**

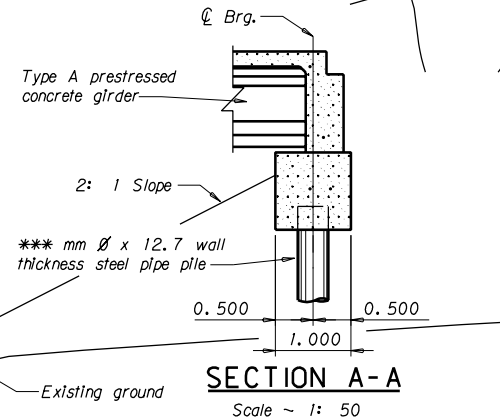
**BR 81001(2)**

CONTROL NO. 4538

SHEET NUMBER **U9**

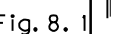
TOTAL SHEETS **9**

$PI$	$= 13+28.78$
$\Delta$	$= 49^{\circ} 45' 58''$ (LT)
$R_c$	$= 490$ m
$L_s$	$= 40.00$ m
$\theta_s$	$= 2^{\circ} 20' 19''$
$\Delta_c$	$= 45^{\circ} 05' 20''$ (LT)
$T_s$	$= 247.34$ m
$L_c$	$= 385.61$ m
$E_s$	$= 50.29$ m
$S$	$= 0.05$ %



Drift:	Severe
Pier Scour (Q10):	1.3 m
Contraction Scour (Q10):	0.3 m
Ice:	Light
Drainage Area:	26 275 sq. km
2-year Stage (Q2):	704.02 m
Base Flood Flow (Q100):	663 m <sup>3</sup> /sec
* Base Flood Stage Elevation:	707.59 m
Base Flood Velocity:	0.63 m/sec
Low Beam Elevation:	708.37 m

Also see Hydraulic Data Summary sheet.  
\*Base Flood Backwater is 0.0 m

DRAWING NO.